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An Introduction to the Concepts of Energy Resonance

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Opening Remarks

Ladies and Gentlemen, it is both a pleasure and an honor to address you today.

It is a pleasure because I will be speaking on a topic which has passionately occupied my life for nearly 20 years, which I consider to be of vital importance to the advancement of mankind.

It is an honor because the subject to be discussed has also been the motivating force in the lives of two men whom I most admire, the late Nikola Tesla, father of modern Electrical Physics, and Guy Obolensky, my teacher for the last seven years and one of my dearest friends.

Introduction

It is 19 years before the turn of the century in the city of Budapest, in Hungary. A tall, lean and gaunt young man from Serbia struggles to regain his health. For months he has been in the grip of a strange and violent malady which has threatened to take his life.

His convalescence is slow, but his will to live is indomitable. He is the youngest man ever to hold the position of Chief Engineer at the Telephone Exchange in Budapest. His name is Nikola Tesla.

As his strength returns, Tesla's thoughts turn with eagerness toward the resumption of his professional duties, and more so to the solution of a problem which has vexed his mind since his second year of engineering school, the harnessing of alternating currents. Always having found great fortification of spirit in nature, the weakened Tesla now retreats to the City Park to enjoy the magnificence of sunset. He is in the company of a former class mate, Szigeti. It is a late afternoon in February in the year of 1881.

The dazzling interplay of color and the prismatic sky which signals the dying of another day infuses life into Tesla's troubled soul. His very being is seized by the contrast between this intense display of cosmic wholeness and the integrated essence which he perceives as himself. The mysteries of the objective and the subjective realities seem to merge; a great truth seems evident and available. He is deeply moved. His sense of the aesthetic escalates to the point of spontaneous expression, and he begins to recite an appropriate verse from *Faust*:

*The glow retreats, done is the day of toil;
It yonder hastens, new fields of life exploring;
Oh, that no wing can lift me from the soil;
Upon its track to follow, follow soaring.....*

Suddenly, Tesla is silent, and staring rigidly at the orb of the setting sun. Szigeti is alarmed, and tries to arouse him, but without success.

Then, as if from a dream, Tesla speaks. His voice is charged with emotion: "Watch me!" - "Now watch me reverse it!"

In a moment of unparalleled lucidity, the mind of a noble man has merged with the mental fabric of a Higher Consciousness and captured a grain of truth to share with mankind. During these few seconds of inspiration, Nikola Tesla has discovered the principle of the rotating magnetic field, and, thus, bequeathed to us the alternating current motor, the very foundation from which our entire polyphase electrical technology has evolved. Tesla is just 25 years of age.

These events mark the beginning of a career unsurpassed to this day by any single individual in the electrical field.

In the remaining 62 years of his life, Tesla was awarded 36 patents for inventions pertaining to motors and generators, nine major patents involving the transmission of electrical power, six patents concerning lighting, seventeen patents on the design of high frequency apparatus, twelve patents on radio, seven patents on turbines and similar apparatus, and hundreds of others far too numerous to mention. Additionally, he authored thousands of lectures and articles, all on his beloved subject of electricity.

This much is history, but what rare gift allowed Nikola Tesla to stand as a giant among men? How was his thinking different? What secret allowed him to discover so many truths?

Perhaps it can be summed up this way: Tesla saw that all of nature was dynamic. Thus, to understand nature, he trained himself to think dynamically. His thought processes always included time as an active component, not a static one. Nikola Tesla possessed a parametric mind!

Power: Dissipative and Conservative

A great deal of confusion seems to arise among professionals and laymen alike when mention is made of the high efficiencies associated with the constant power systems of the Parametric variety. In conventional Power Systems, the number of independent variables is kept to an absolute minimum. An example of this can be found in modern Electrical Transmission networks, in which the only effective variable is the current. In sharp contrast to this situation,

there can be many related variables in a parametric power system, each of which is phase locked one to the other, and all of which are synchronized to a common time base.

The word "parametric" apparently has no impact on the average mind, for immediately vehement arguments are advanced supporting the dissipative nature of all power systems and their limitations in accordance with the well-established laws of entropy. Additionally, the traditional defender will almost always be pleased to inform any inquiring novice that all known power systems have long ago been developed to their highest permissible levels of efficiency, and any notable improvement would represent a violation of the Second Law of Thermodynamics.

In rebuttal to such rigid attitudes, it is most important to realize that two types of work systems are known to the physicist. There is the non-conservative, or the dissipative, work function, which is responsible for the evolution of heat or any other non-recoverable energy form. And there is the conservative, or recoverable work function, which makes itself known by effecting a useful change in some other form of energy, such as kinetic, gravitational potential, or chemical, to itemize only a few.

Accordingly, then, there are also two types of power to consider: the dissipative form and the conservative form. It is the second type of power to which we must ultimately address our attention if we wish to gain an insight into the complexities of Parametric Physics. However, for the sake of ensuring continuity in the development of this theme, the dissipative power system shall be explained first.

Imagine a mass sliding down an inclined plane. The slope of this plane, and the frictional coefficient of its surface are such that the mass m shall descend with a constant velocity v

Under these conditions, the force of gravity, acting upon the descending mass, shall develop a constant power over the entire course of the mass movement. This power shall represent the time rate of work done by the force of friction over the surface of the incline traversed by m .

The question now arises, however, what work can the force of friction do? Unfortunately, it can only generate heat, and heat is a dissipative agent. Therefore, although this hypothetical system can indeed produce a constant power over a designated interval, the type of power delivered is non-recoverable, and therefore, can serve no further use.

What then of the other form of power? How can its meaning be approached? Of what use is it, and under what conditions is it constant?

Consider the familiar expression for Kinetic Energy:

$$E_K = \frac{1}{2}mv^2$$

Differentiating this equation with respect to time yields

$$P = mv \frac{dv}{dt}$$

But,

$$\frac{dv}{dt} = a$$

;

$$P = mva$$

Now, if v and a are transposed, a common relationship for the instantaneous power is arrived at:

$$P = mav$$

and, recalling that if

$$F = ma$$

And

$$v = d/t$$

, and substituting, an expression for power involving force, distance and time is evolved, namely,

$$P = F \frac{d}{t}$$

It is most certainly known that the work done in any system must be equal to the available energy, and it is further known that the power produced is indeed the rate of change of the work done. Why then should the energy derivative be related only to the dissipative power function?

Reconsider the previously obtained energy derivative in its original form:

$$\frac{dE_K}{dt} = (mv) \frac{dv}{dt}$$

Note that, as derived, this statement reads: "The rate of change of Kinetic Energy with respect to the change in time is equal to the momentum times the rate of change of the velocity with respect to the change in time." The expression " dv/dt " is, of course, an acceleration, so bearing this in mind, an equivalent statement for the above equation can be written

$$P = (mv)a$$

And now the question can be asked: "Does any circumstance exist in which some form of constant power can manifest in a system undergoing an acceleration?"

The search for such a condition must undoubtedly begin with an examination of the energy and power characteristics associated with some common source of acceleration. Naturally, the most obvious example available is that provided by the force of gravity.

This acceleration, when undiluted by vector resolution, and when considered in near proximity to the earth's surface, has a value of approximately 32 feet/sec/sec , and may be represented by the constant g . Hence,

$$a = g$$

and from this basic relationship, expressions governing the velocity and displacement resulting from the action of the gravitational force acting upon any mass may be derived.

For the velocity:

$$v = gt$$

For the displacement:

$$s = \frac{1}{2}gt^2$$

Provided now with this information, an examination of the behavior of a point mass acting under the influence of the earth's gravitational field becomes completely academic.

Consider at this point the originally proposed inclined plane. Any mass supported by its surface will experience a coplanar force of magnitude $mg \sin \theta$. Hence, since

$$a = F/m$$

, the coplanar acceleration vector will have a magnitude of:

$$a = F/m$$

$$F = mg \sin \theta$$

$$a = mg \sin \theta / m$$

$$a = g \sin \theta$$

For the case in question, suppose the slope of the plane to be 30° . The specific values for the expression $g \sin \theta$ may be substituted into the equation as follows:

$$a = g \sin 30^\circ$$

$$a = (32)(\sin 30^\circ)$$

$$a = (32)(0.5)$$

$$a = 16ft/sec^2$$

This resulting acceleration value may now be utilized in each of the general equations of motion, yielding new expressions particular to the plane in question:

For the acceleration,

$$a = 16ft/sec^2$$

For the velocity,

$$v = 16t$$

For the displacement,

$$s = 8t^2$$

Using these relationships, the standard expression for Kinetic Energy, $E_K = \frac{1}{2}mv^2$, and the instantaneous power formula relevant to this particular situation, $P = (mv)g \sin \theta$, graphs of all significant parameters could be plotted.

Examining the first of these graphs, it will immediately be seen that the acceleration is constant over the period under examination. This is a direct consequence of the fact that the coplanar force, $mg \sin \theta$, is a constant over the entire length of the inclined plane.

The velocity, as would be seen in a second graph, increases linearly. Once having observed the system's acceleration to be a constant, this fact could easily have been anticipated by recalling the basic definition of an acceleration, namely, dv/dt ; only the differentiation of a linear equation can yield an expression which is a constant.

An examination of the values in a third graph, which would represent the displacement, would reveal an interesting fact that they increase in proportions of 1, 4, 9, 16, 25, 36, etc. This is an indication of the fact that the displacement curve is an equation of the second order, such is $y = x^2$. A study of the graphs for the vertical velocity component and the kinetic energy would also reveal them to be square functions. This is most significant, and serves to direct the attention to the relationship which exists between the vertical displacement and the energy.

Because the Potential Energy, mgh , is a function of the height above some reference plane, it stands to reason that the vertical component of the displacement should be directly related to the Kinetic Energy. This relationship is borne out in the Conservation of Energy Theorem:

$$E_{Potential} = E_{Kinetic}$$

$$mgh = \frac{1}{2}mv^2$$

Accordingly, then, it should also stand to reason that some important relationship must also exist between the rate of change of energy and the rate of change in the height. Following this line of reasoning to its logical conclusion, both the Potential and the Kinetic components of the preceding mathematical sentences are now differentiated with respect to time

$$E_P = mgh$$

$$\frac{dE_P}{dt} = \frac{d(mgh)}{dt}$$

$$P_1 = mg \frac{dh}{dt}$$

$$E_K = \frac{1}{2}mv^2$$

$$\frac{dE_K}{dt} = \frac{d(\frac{1}{2}mv^2)}{dt}$$

$$P_2 = mv \frac{dv}{dt}$$

These resulting relationships are both expressions of power. P_2 represents the rate of change of energy in the accelerating mass m , or the instantaneous work done upon that body per increment of time dt . P_1 represents the rate of change in the gravitational potential energy, or the corresponding instantaneous change in the earth's "restorative work function", which is surrendered to the accelerating body per increment of time dt .

P_1 may now be equated to P_2 , yielding:

$$mg \frac{dh}{dt} = mav$$

and, if

$$a = g$$

Then,

$$mg \frac{dh}{dt} = mgv$$

$$\frac{dh}{dt} = v$$

where v is understood to actually be the vertical velocity component v_y of the overall velocity.
Hence:

$$\frac{dh}{dt} = v_y$$

This premise is the most important presented thus far, for though it may be obvious that dh/dt must be a velocity, far deeper implications are suggested.

Consider again the following Power formula:

$$P = mg \frac{dh}{dt}$$

Note that mg may be replaced by its equivalent value, W , Hence:

$$P = W \frac{dh}{dt}$$

Because the weight, W is a constant, the power developed by the system is directly proportional to dh/dt , or v_y . This, then, explains why the profile of the velocity curve matches the profile of the system's power curve.

Contemplation upon these results suggests an interpretation that may well lead to a general law long overlooked, or at least only partially understood:

"The conservative power developed in any system may be made to conform to the profile of any equation whatsoever, so long as that component of the developed velocity which is parallel to the natural line of action produced by the gradient in question is properly manipulated by the imposition of an appropriately distributed impedance."

Or, more simply stated, "The time structure of the Kinetic Energy developed in any system will be a function of the manner in which the gradient is deployed with respect to the displacement, and the power evolved will be the rate of change of this function."

In accordance with this postulate just advanced, an answer to the question posed earlier may now be ventured: "The circumstance in which constant power can manifest in a system undergoing an acceleration will be found in any arrangement which provides for the development of a constant velocity component by the body traversing the gradient, *such that the mass will drop through portions of the gradient having equivalent potentials in equal periods of time*".

Linear Energy and Energy Resonance

Dwelling on the realization that the instantaneous power is a derivative of the Energy Function in any system, it becomes clear that, if the conservative power is constant in a given application, then the energy which gives rise to it must, of necessity, be represented by a linear equation. And if the energy is represented by a linear equation, then its amplitude must build in discreet steps which increase according to even integer proportions such as 1, 2, 3, 4, 5, 6, etc. Here, then, resides the most important qualification for describing a Parametric Energy System; the energy must be structured in time; it must be quantified!

No one should be surprised at this statement, for there is no reason why certain of the principles inherent in quantum mechanics of particles should not be applicable to macroscopic systems as well. However, because total parity has not yet been proven between these two systems, hereinafter the term Linear Energy rather than Quantized Energy, will be used to further descriptions of the energy in Parametric Systems.

Before proceeding with the development of further concepts associated with Linear Energy Systems, it is imperative that one basic precept be well understood.

What is perhaps most crucial, and most confusing, is the notion of a constant velocity component in an accelerating system.

A little reflection on this situation will yield the fact that the motion in question here cannot be rectilinear, but must obviously be a compound form of motion, having components on at least two axis systems.

It can be hypothesized, then, that the motion under study must, of necessity, represent some form of angular velocity, one component of which remains constant in magnitude. If the vertical velocity component, vy , is assigned this fixed character, then vyt will represent the vertical displacement over the elapsed time, or the height dropped through. Accordingly, then, the product of the vertical velocity component and the time defines the relationship between a "quantum" of Potential Energy and a "quantum" of Kinetic Energy in a Linear Energy System. This is demonstrated in the following derivation:

$$E_{Potential} = E_{Kinetic}$$

$$mgh = \frac{1}{2}mv^2$$

$$\frac{1}{2}v^2 = gh$$

$$h = vyt$$

$$v^2 = 2gvyt$$

$$v = \sqrt{2vyt}$$

Following through by substituting this evolved value of v into the classical formula for Kinetic Energy yields an expression for linear Kinetic Energy:

$$E_K = \frac{1}{2}m(2gvyt)$$

$$E_K = mgvyt$$

$$mg = W$$

$$E_K = Wvyt$$

This equation is obviously of the first order, which conforms completely to the theory here under development, and rigorously supports the concept of a Linear Energy structure.

In order to develop an expression for the acceleration, the velocity formula is now differentiated with respect to time, yielding:

$$a = \frac{(gvy)}{\sqrt{2gvyt}}$$

In accordance with these developments, the instantaneous power may now be represented by the differentiation of and substitution into the classical Kinetic Energy formula $E_K = \frac{1}{2}mv^2$, which produces:

$$P = mgvy$$

$$mg = W$$

$$P = Wvy$$

Note that the power must be a constant as it is the product of two other constants.

It should be obvious at this point that in order to ensure the production of constant power over the entire range available in the gradient, two requirements must be met and upheld. First of all, the body in question must drop through equal segments of potential in equal periods of time. This ensures that the change in Potential Energy with respect to time is linear. Secondly,

the applied force must decrease while the displacement increases as a function of the acquired velocity. These conditions ensure that the change in the Kinetic Energy with respect to time is also linear.

In order to fulfill these requirements, the gradient must be "structured" in a very specific manner. An "impedance" therefore must be "imposed" upon the gradient to distribute its effects in space and time, such that the acquired energy will be linear and the developed power constant.

In the realm of simple mechanics, an inclined plane represents an impedance imposed on the gravitational gradient. However, the effects of such an impedance upon the acquired energy were discussed previously, and the results were certainly not linear.

In order to design an adequate impedance for linearizing the energy extracted from the gravitational gradient, it is only necessary to compute the x and y coordinates traced out by a particle moving according to such a law that the square of each instantaneous value of its velocity is made to yield a line of constant slope when plotted with respect to time. Such is the case for the expression

$$v = \sqrt{2gvyt}$$

Hence, the first step which must be taken in producing an "impedance structure" for the case under study is an examination of the component displacements produced by a particle moving in accordance with the equation,

$$v = \sqrt{2gvyt}$$

The vertical velocity component, vy , is constant by definition. Therefore, the y coordinate, or the vertical displacement, is simply t . Obtaining the x coordinate, however, shall prove to be somewhat more difficult.

The first step will obviously be to represent the horizontal velocity component, vx , by an algebraic statement. Because the velocity vectors vy and vx are orthogonally situated, this can easily be accomplished by the use of the Pythagorean Theorem.

Hence:

$$vx = \sqrt{(2bvyt) - (vy)^2}$$

If the function vx were plotted it would be found to be nonlinear. The exact displacement experienced by a particle during any time interval can only be found by computing the area under this curve, which is bounded by the time intervals question. This is achieved by the implementation of integral calculus. First, a general expression is evolved for the displacement x by solving for the indefinite integral of dx/dt :

$$vx = \sqrt{(2bv yt) - (vy)^2}$$

$$X = \frac{\frac{2}{3}[(2gv yt) - (vy)^2]^{1.5}}{2gv yt}$$

The differential values for X can then be obtained by solving the definite integral

$$\Delta X = \int_{t_0}^t \frac{\frac{2}{3}[(2gv yt) - (vy)^2]^{1.5}}{(2gv yt)} dt$$

where t_0 and t represent actual values of time. However, this type of solution requires definite numerical values, not merely algebraic variables, therefore it now becomes necessary to develop a specific problem from which data can be derived.

Assume that it is desirable to induce constant power in a point mass m which is falling through the gravitational gradient. Assume further that it is necessary for this mass to acquire the equivalent energy contained in 5-foot intervals of the gradient in equal intervals of time. If the mass m is assigned a value of 2 slugs, then the energy acquired per potential drop differential must be:

$$E_p = mgh$$

$$E_p = (2)(32)(0.5)$$

$$E_p = 32 \text{ ft lbs}$$

Because the time interval is critical, but of arbitrary duration in this case, the time unit chosen shall be defined as that interval required for a mass, starting from rest, to fall 0.5 feet in a standard gravitational field, while neglecting the effects of friction. Hence, the time interval shall be obtained as follows:

$$s = \frac{1}{2}gt^2$$

$$s = h$$

$$\frac{1}{2}gt^2 = h$$

$$st^2 = 2h$$

$$t^2 = 2h/g$$

$$t = \sqrt{2h/g}$$

where:

$$h = 0.5 \text{ ft}$$

$$g = 32 \text{ ft/sec}^2$$

$$t = \sqrt{2(0.5)/32}$$

$$t = 0.1767767$$

Now, recalling that the vertical distance h has been defined as t , the magnitude of the necessary vertical velocity component can also be found:

$$vy = h/t$$

$$vy = 0.5/0.1767767$$

$$vy = 2.8284271 \text{ ft/sec}$$

Inserting this velocity value into a formula for constant power yields:

$$P = m g vy$$

$$P = (2)(32)(2.8284271)$$

$$P = 181.01934$$

Hence, a constant power of $181.01934 \text{ ft lbs/sec}$ shall be developed by this hypothetical system, and the time flow shall be in intervals of 0.1767767 seconds.

Returning with this information to the definite integral

$$\Delta X = \int_{t_0}^t \frac{\frac{2}{3}[(2gvyt)-(vy)^2]*1.5}{(2gvyt)}$$

numerical solutions may now be commenced utilizing the defined parameters and the following time intervals:

$$t_1 = 0.1767767 \text{ sec} \quad t_6 = 1.0606602 \text{ sec}$$

$$t_2 = 0.3535534 \text{ sec} \quad t_7 = 1.2374369 \text{ sec}$$

$$t_3 = 0.5303301 \text{ sec} \quad t_8 = 1.4142136 \text{ sec}$$

$$t_4 = 0.7071068 \text{ sec} \quad t_9 = 1.5909903 \text{ sec}$$

$$t_5 = 0.8838835 \text{ sec} \quad t_{10} = 1.767767 \text{ sec}$$

Standard calculations using the just described integration formula and the supplied data have given rise to a series of X coordinates.

$$x1 = 0.4290447 \quad x6 = 9.1990406$$

$$\begin{array}{ll}
x_2 = 1.5393868 & x_7 = 11.687376 \\
x_3 = 3.0362714 & x_8 = 14.379324 \\
x_4 = 4.8372606 & x_9 = 17.251264 \\
x_5 = 6.8976224 & x_{10} = 20.290076
\end{array}$$

And the y coordinates are:

$$\begin{array}{ll}
y_1 = -0.5 \text{ ft} & y_6 = -3.0 \text{ ft} \\
y_2 = -1.0 \text{ ft} & y_7 = -3.5 \text{ ft} \\
y_3 = -1.5 \text{ ft} & y_8 = -4.0 \text{ ft} \\
y_4 = -2.0 \text{ ft} & y_9 = -4.5 \text{ ft} \\
y_5 = -2.5 \text{ ft} & y_{10} = -5.0 \text{ ft}
\end{array}$$

The plot of this data is the displacement curve traced out by the mass m during its descent, and its geometric profile is the necessary "impedance structure" to promote the linearizing of the energy extracted from the gradient.

This displacement curve could be plotted by laying off the appropriate x and y coordinate values with respect to a central system origin, $(0,0)$, and as such, it represents a graphic expression in the rectangular coordinate system. However, because the displacement obviously represents the path of an angular motion, the acquired energy characteristics should actually be studied in a polar format. This can be achieved if new calculations are made upon the existing curve with respect to some second origin, $(0,0)'$, such that each point (x,y) is associated with some radius vector emanating from $(0,0)'$, and some angular displacement beneath the zero plane indicated by θ .

Let the second origin $(0,0)'$, be located an arbitrary distance of 24 units from $(0,0)$ along the positive x axis. This done, it will immediately become obvious that any x coordinate whose magnitude is expressed with respect to the origin, $(0,0)$ can now be re-expressed in terms of the second origin, $(0,0)'$, by designating its value as the difference between 24 and x , or $24 - x$.

Accordingly, then, by additional use of the Pythagorean Theorem, an expression of x and y in r is quickly developed:

$$\begin{aligned}
r^2 &= x^2 + y^2 \\
x &= (24 - x) \\
r^2 &= (24 - x)^2 + y^2 \\
r^2 &= (256 - 48x + x^2) + y^2
\end{aligned}$$

Substitution of this relationship into the classical formula for Angular Kinetic Energy now allows the evolution of an expression which defines the angular velocity ω for this particular system:

$$\omega = \sqrt{\frac{1}{m} * \frac{2E_K}{(256-48x+x^2)+y^2}}$$

Having obtained a means for delivering the angular velocity, a statement representing the magnitude of the radius vector may now be obtained as follows:

$$\frac{1}{2}I\omega = E_K$$

$$\frac{1}{2}mr^2\omega = E_K$$

$$mr^2\omega = 2E_K$$

$$r^2 = 2E_K/\omega^2 m$$

$$r = \sqrt{2E_K/\omega^2 m}$$

The utilization of these formulas and the classical relationship describing angular motion give rise, now, to a considerable volume of new information after a few simple calculations. If these results were charted, a study of the graphs would quickly reveal the fact that all of the plots except for those exhibiting the angular work, and the angular power, are nonlinear. This gives rise to a thought worthy of consideration. *Apparently, linear parameters develop non-linear energy curves, while non-linear parameters seem to be responsible for the evolution of linear energy curves.* This suggests the development of interesting, but complicated, scaling problems in the engineering of Linear Energy Systems. It may also explain why effects of this kind have never been stumbled upon; the designer must know exactly what he is doing!

If it were possible for you to mentally observe the behavior of the moment of inertia in this system, you would notice the steady and continual change in the length of the radius vector over each interval. The rate of change of r with respect to t must be precisely determined and controlled, such that the dynamic change in the moment of inertia, first retards the acceleration, and then, when required, assists it, but in such a manner as to insure that the product of the instantaneous torque and the instantaneous angular velocity are always equal to some predetermined constant, and the time interval between each event is the same.

Because each separate interval is equal in time, the total time is a cyclic constant. Here, then, lies the true meaning of the elusive concept of the dynamic constant, otherwise known as the phenomenon of constant period!

Further reflection on these concepts will disclose facts even more incredible! The angular velocity may be represented in terms of a frequency f :

$$\omega = 2\pi f$$

Hence, the frequency is simply

$$f = \omega/2\pi$$

Because 2π is a constant, the frequency is seen to be in direct proportion to the angular velocity. However, this presents an information conflict in terms of classical theory. How can the period be constant if the frequency is changing in time and phase?

The answer to this apparent contradiction lies in the fact that the combined energies contained in each instantaneous frequency sum together in quantum increments with the passage of time. In this way, each frequency involved contributes to *the total volume of energy in the system and, theoretically, the total of quantity of the available energy can increase linearly without bound! Thus, the energy has been made to resonate!* This is the true meaning of Linearized Energy! And it is now understood that *the constant period is the reciprocal of the overage frequency.*

It is important to understand that this process is diametrically opposite to Frequency Resonance. For when a particular frequency is made resonant, the system parameters are adjusted so as to maximize the amplitude of the fundamental wave in question and suppress all other frequencies and harmonics to some ineffective level. In doing this, however, more than 36.4% of the energy which could have been made available for use is discarded!

The correct integration of all this data is essential to gaining insight into the unusual operation of Resonant Energy Systems. It must be understood that the incoming power flow is made to become constant in time, thus the energy simply continues to accumulate linearly. Here, then, lies the mechanism which provides the efficiency advantage associated with Resonant Energy: the primary source never delivers energy directly to a dissipative load, but rather to an energy storage system which then, over the second half cycle, delivers its accumulated energy to the load at hand.

Having set forth these foundations with relatively basic mechanical analogies, it will now be a rather simple matter to introduce the concept of FASER.

FASER

The "Force Amplification Stimulated Energy Resonance" in FASER systems makes use of parametric limit cycles such that maximum work is done with minimum energy. Synergy is achieved because all the energy is cohered. With the energy resonance, characterized by FASER, all frequencies become Doppler shifted into harmonics which are thus amplified, so that when the energy structure periodically transforms, discord cannot increase. This is true simplification.

With frequency resonance, characterized by MASER and LASER, the use of harmonics must be eliminated since no attention is paid to the possibility of Doppler shifting the frequencies. By

attrition of these harmonics, the fundamental frequency is all that remains to be used. Contrary to popular belief, this is not real amplification. By way of example, *with perfect transmission, only 50% of the total energy can be accessed.* Here, according to the maximum energy transfer theorem, it can be shown that to maintain the necessary working gradient, *at least 50% of the energy must be wasted.*

The FASER Ballast

An immediate demonstration of the principles of FASER can be seen in their application to the design of ballasts for gaseous discharge lamps. Ballasts serve to allow this kind of lamp to function without exploding. They provide a smooth and efficient transmission of energy from the source of electrical potential to the load represented by the confined discharge.

The ballast required for High Intensity Discharge lamps must manage its energy in such a way as to create a high voltage impulse to turn the gas into a plasma, and then to provide the proper impedance factor (e.g. to choke down the current to a value that can be supported by the particular electrodes of the lamp.) In the case of the HID lamp and the fluorescent lighting, the ballast needs to manage the cold striking voltage and to provide the proper impedance factor.

Conventional ballasts cannot optimize the current loading of the electrodes because of dynamical problems with the gas itself. The FASER ballast is unique in that it has *momentum compensating* circuits, and if the circuit is alternating, FASER further refines the use of the current so that *the energy normally lost as heat can be recycled and turned back to useful work.*

The resulting benefits of a FASER ballast over present day ballasts are the following:

- (1) It provides a flicker-free light.
- (2) The bulbs will not heat as much because the electrodes are actually optimally cooled by electron evaporation. (The implications for television and film production are obvious.) This, in turn, allows the lamps to function at least four times longer.
- (3) It provides a wider dynamic range, so that manufacturing variations in the lamp itself will not affect the efficacy.
- (4) It provides a better quality of light: colors are clearer, brighter and more natural, as in sunlight.
- (5) It uses less material and therefore can be less expensive and lighter than conventional ballasts.
- (6) Finally, the FASER ballast is highly efficacious. It provides twenty percent more light for the same amount of electrical energy than any other known technique, when measured at the bulb itself. Furthermore, when combined with an optimized HID lamp, the synergy of the system enables the same amount of light as a color corrected standard tungsten light to be produced with ninety-five percent less electricity.

Now, without any further ado, I'd like to introduce a very special person, Mr. Guy Obolensky...